

Measurement of Isobaric Heat Capacity of Pure Water at High Temperature and High Pressure

Xiangyang Liu^S, Maogang He^C, Ying Zhang and Xiaogang Dou

Xi'an Jiaotong University, MOE Key Laboratory of Thermal Fluid Science and Engineering, Xi'an, Shaanxi, China

mghe@mail.xjtu.edu.cn

Of all pure engineering fluids, water is among the most important substances in existence. It is widely used as a working fluid in steam power cycles which supply electricity in large amounts to the industrialized world and in chemical systems, especially at high temperature and high pressure condition. It is well known that heat capacity is a basic thermophysical property of fluids. Accurate experimental heat capacity data are required for energy balances in chemical or energy processes, and for the design and control stages. Variations in heat capacities are also useful for understanding changes in the structure of fluids, even isobaric heat capacity data at different pressures can be used to validate equations of state. A release on the IAPWS Formulation 1995 for the thermodynamic properties of ordinary water substance has been issued by the International Association for the Properties of Water and Steam in 1995, which is generally accepted as reliable by the scientific community. However, in that work, nearly all the data for the isobaric heat capacity of water are based on measurements of Sirota's group in the period from 1956 to 1970. So, the accuracy of the IAPWS Formulation 1995 needs to be checked on the basis of new experimental data. The present work reports experimental results concerning the specific isobaric heat capacity of pure water at high temperature and high pressure condition. Experiments were performed using a high pressure and high temperature horizontal flow calorimeter. The measurements are carried out up to 673K for temperature, up to 30 MPa for pressure. A detailed comparison of the new experimental results with the calculated values from the IAPWS Formulation 1995 is presented.